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REMARKS

The examiner requires restriction to one of the following groups of inventions: Group I, directed to a hot melt adhesive (claims 1-8), Group II, directed to an article including adhesive (claims 9-11, 13 and 14) and Group III, directed to a method of bonding (claims 12, 15 and 16). Applicants hereby confirm the prior oral election of the invention of Group I for prosecution on the merits. This election was made without traverse.

Non-elected claims 9-16 have been canceled. Claims 17- 23 have been newly added. Support may be found in the claims as originally filed and on page 2, lines 17-30, page 5, line 22 and page 7, lines 19-20. All newly added claims read on the elected invention. No new matter has been added. Entry is requested.

Claims 1-3 and 5-7 are rejected on the ground of nonstatutory obviousness-type double patenting over claims 1-19 of U.S. Patent No. 6,794,443(Chu et al.). The examiner urges that at least 550grams/10 minutes encompasses at least 750 and 900 grams/10minutes.

Applicants disagree. Chu claims hot melt adhesives comprising ethylene vinyl acetate and/or ethylene 2-ethyl hexyl acrylate. In contrast, the adhesives claimed by applicants comprise a mixture of ethylene vinyl acetate and ethylene n-butyl acrylate copolymers. Applicants' claims 1-3 and 5-7 are not obvious from the claims of Chu. Withdrawal of the obviousness-type double patenting rejection is requested.

Claims 1-3 and 5-7 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Krutzel (US 5,340,863), Liedermooy et al. (U.S. 5,500,472), Godfrey (U.S. 5,763,516), Mehaffy et al. (U.S. 6,117,645), Haner et al. (U.S. 6,593,407) or National Starch (EP 0721 006).

Krutzel fails to describe or suggest adhesives comprising a mixture of EVA and EnBA copolymers as required in applicants' claims 1-8 and 18-23 and fail to teach or suggest the use of a maleic anhydride modified gum rosins as required in applicants claims 1-8 and 17-23, let alone the use of maleic anhydride modified Chinese gum rosins as required in applicants' claims 4, 8, 17 and 18. Moreover, it is clear that the adhesives of Krutzel are not formulated for application at low temperature. Reference is made to Table 3, bridging cols 9 and 10, where viscosity is reported. The claimed invention would not be obvious from the disclosure of Krutzel. Withdrawal is requested.

Liedermooy discloses EnBA based hot melt adhesives that may also comprise a small amount of a polymeric additives. Types of polymeric additives are listed at col. 3, lines 41-50, but none are exemplified. The adhesives of Liedermoooy use, as tackifier, terpene phenolic resins. Terpene phenolic resins are not modified gum rosins. Liedermoooy fails to teach or suggest the use of a maleic anhydride modified gum rosins as required in applicants' claims 1-8 and 17-23, let alone the use of maleic anhydride modified Chinese gum rosins as required in applicants' claims 4, 8, 17 and 18. The claimed invention would not be obvious from the disclosure of Liedermoooy. Withdrawal is requested.

Godfrey fails to teach or suggest hot melt adhesives comprising a mixture of EVA and EnBA copolymers and also fails to teach or suggest use of modified gum rosin ester as tackifier. The claimed invention would not be obvious from the disclosure of Godfrey. Withdrawal is requested.

Mehaffy describes EVA based hot melt adhesives. There is no disclosure or suggestion of hot melt adhesives comprising a mixture of EVA and EnBA and comprising a maleic anhydride modified gum rosin ester tackifier. The claimed invention would not be obvious from the disclosure of Mehaffy. Withdrawal is requested.

The tackifers disclosed for use by Haner are phenolic-modified rosin esters. Haner, like Liedermooy and Mehaffy, fail to disclose low application temperature hot melt adhesives that comprise a mixture of EVA and EnBA and comprise a maleic anhydride modified gum rosin ester tackifier. The claimed invention would not be obvious from the disclosure of Haner. Withdrawal is requested.

National Starch describes EnBA based hot melt adhesives. There is no disclosure or suggestion of hot melt adhesives comprising a mixture of EVA and EnBA and comprising a maleic anhydride modified gum rosin ester tackifier. The claimed invention would not be obvious from the disclosure of National Starch. Withdrawal is requested.

He examiner has requested clarification as to the term "minimum softening point." Use of this terminology would be apparent to the skilled artisan as meaning that the softening point may not be below the recited minimum temperature. As this recitation is unnecessary, its use has been canceled.

Favorable action is requested.

Respectfully submitted,

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SUGGESTED PROCEDURE FOR EVALUATING THE HEAT STRESS RESISTANCE OF HOT MELT ADHESIVES

IoPP Adhesion Committee

Purpose

This test was designed to determine the ranking of hot melt adhesives based on their resistance to bond failure at elevated temperatures. The test is not designed to give use temperature rating even though pass and fail temperatures are determined. Under production conditions, factors such as spring back force (the tendency of a box flap to remain open), type of substrate, amount of adhesive applied, and the placement of the adhesive may control the performance of the bond. This test is designed to indicate which adhesive will have the higher use temperature when all other variables are held constant. It is important to test all use conditions that a package will be exposed to when changing adhesives to ensure that adhesion, machinability, and performance at all temperature and humidity conditions are acceptable.

This paper was submitted by the IoPP Adhesion Committee for inclusion in the *IoPP Technical Journal*. The paper is a product of several years of research by the Adhesion Committee, completed under the leadership of Past-Chair Alex Gonsalves of H. B. Fuller and current Chair Ken Wallin of Joseph E. Seagrams. Tests discussed in this paper were conducted by John Isenberg of Eastman Chemical Products Co.

The test was designed to be performed with a minimum of cost and labor. It is noted in the procedure where additional equipment or labor may result in better repeatability or accuracy. Although considerable testing has been done using this procedure, complete statistical validation has not been done.

Equipment

1. *Air circulating oven*–An oven large enough to hold the testing fixture, 35 cm wide x 20 cm high x 35 cm deep minimum (14" x 8" x 14"), with ± 1°C (1.8°F) temperature control over a temperature range of 30-100°C (86-212°F).

2. *Test sample holder*–The test sample holder can be made from commonly available materials consisting of square tubing, angle, and flat metal, either steel or aluminum as shown in Figure 1.

The length can be made to suit the available oven. The 200-gram weight, Figure 2, is a 3.2 cm (1.25") diameter steel shaft approximately 3.2 cm (1.25") long with a 3 mm (1/8") rolled pin inserted in one end to hold the weight in place on the sample during testing.

3. *Hot melt applicator*–A suitable applicator to place a uniform bead at a controlled temperature is required.

Sample Preparation

Cut 1400 kPa (200 psi) test strength or greater corrugated boardstock into sizes of 5 x 8 cm (2" x 3 3/16") and

5 x 14 cm (2" x 5 1/2") with the flutes running in the long direction. The boardstock is bonded using 25 mg/cm (0.00014 lb/in) of the test adhesive using a melt temperature of 175°C (347°F), 2 seconds open time and 5 seconds of compression at 35 kPa (5 psi) over the bonded area. The adhesive bead runs perpendicular to the flutes centered on the shorter sample and 2 cm (3/4") from one end of the long sample (see Figure 3).

Notes: The choice of substrate does not appear to be critical; however, the substrate must be still enough to hold the weight without excessive bending (15° below horizontal) or collapsing. Kraft boardstock that is easy to adhere to without coatings or printing is suggested. Use the same lot of material as much as possible. Conditioning of the boardstock has not been found to be critical; however, boardstock conditioned at 23°C (73°F) and 50% relative humidity for at least 24 hours may give more consistent bonds.

The melt temperature, open time, compression time, and compression force do not appear to be critical for this test and may be varied to fit unusual adhesives.

The objective is to make bonds that fail cohesively rather than adhesive failure at the elevated temperatures.

The area covered by the adhesive is the most critical part of the sample preparation. Generally, the amount of adhesive applied is the controlling factor in the covered area. The amount of adhesive applied should be controlled to ±10%.

It is suggested that the bonded samples be conditioned at 23°C (73°F) for 24 hours before oven testing begins, although no testing has been done that indicates that this is a critical variable.

Testing

The samples are loaded into the test sample holder with the end of the short boardstock positioned directly above the edge of the 17cm (6.75") wide plate and secured by the top plate using wing nuts (see Figure 4). The weight is placed 6 cm from the

Figure 1. Test Sample Holder

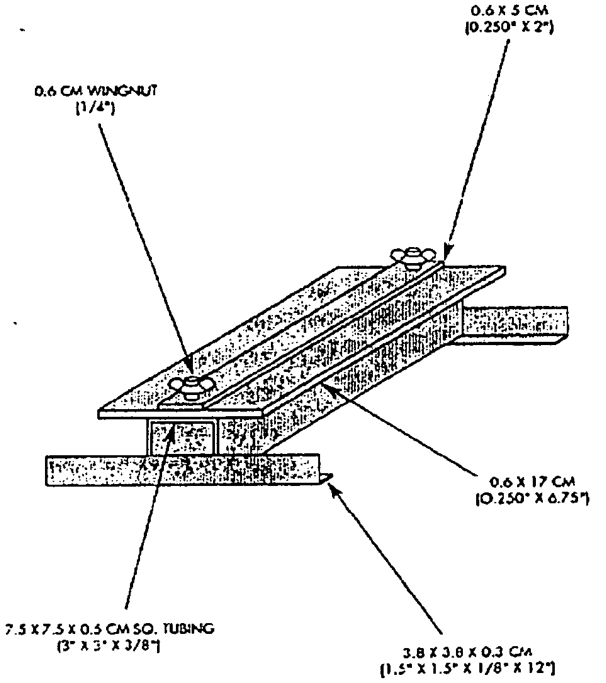
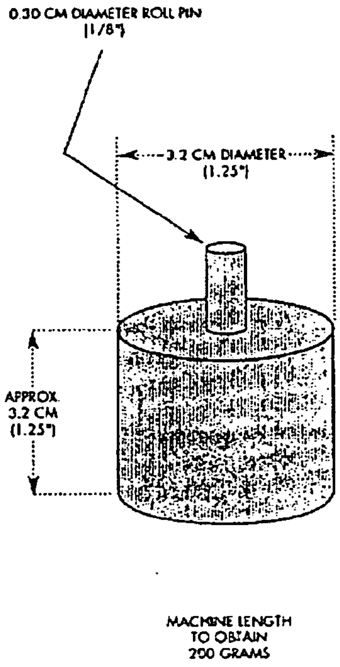


Figure 2. Test Weight



edge of the test holder in the provided hole. The weight is a total of 10 cm from the center of the bond. The entire assembly is placed in the forced air oven at a selected test temperature for 24 hours.

If the bonds failed, new samples should be tested at a lower temperature for 24 hours. If the bonds remained intact, then it is suggested that new samples be tested at a higher temperature for 24 hours. A suggested starting temperature is 65-75°C (150-167°F).

The oven temperature is varied to determine the maximum temperature that at least 80% of the samples remain bonded. It is suggested that at least five samples be tested at each temperature. The temperature should be raised or lowered in 5°C increments after finding the general brackets of the failure temperature. In initial tests, all failures or all passes suggests a new temperature 10-15°C lower or higher for the next test.

Notes

Oven temperature: The oven temperature should be controlled to ±1°C (1.8°F).

Test samples: The amount of adhesive and the width of the compressed bond must be consistent to obtain repeatable results. The bonded width is the controlling factor and the most critical variable in the test. Failed bonds should be measured to ensure a consistent bond area. The placement of the samples in the test holder must be accurate.

Sample preparation: A Waldorf hot-melt bond simulator is a suggested method of producing the bonded samples. This requires modification of the unit and is the subject of another procedure. ■

References

1. Recommended Test Procedures, Packaging Institute International, #T-3005. (Available through IoPP)

2. Manual of Testing Methods for Label Adhesives, Packaging Institute International. (Available through IoPP)

Figure 3. Test Sample

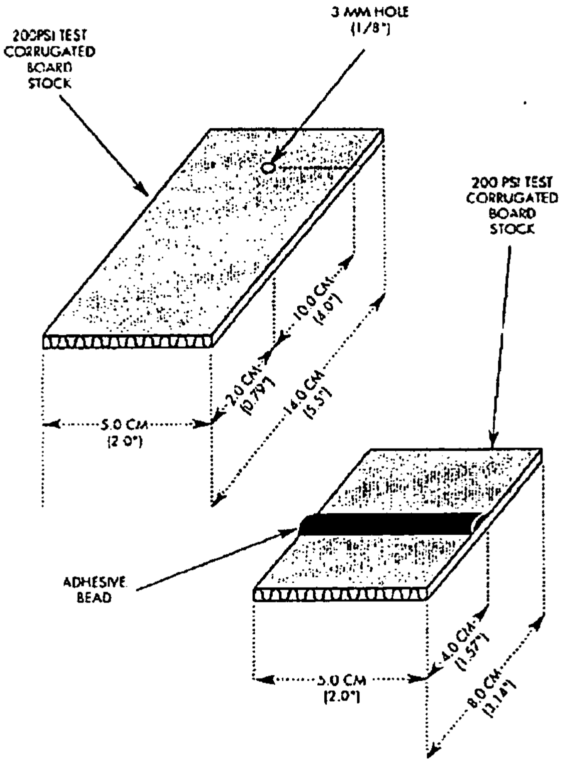


Figure 4. Sample Holder Assembled